



The Control of Neglected Tropical Diseases: A Focus on Visceral Leishmaniasis and Dengue in Bangladesh

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論文の内容の要旨

（目的）

The overall purpose of this study was to demonstrate effective and sustainable control strategies for visceral leishmaniasis (VL) and dengue, two of the most prevalent neglected tropical diseases (NTDs), in Bangladesh.

The role of active disease surveillance and neem extract intervention to control VL was evaluated. For dengue, containers serving as the primary breeding sites of *Aedes* larvae were identified in order to focus on targeted vector control strategies.

（対象と方法）

Active disease surveillance using a simple diagnostic tool, rapid rK39 dipstick test, was conducted in a VL endemic area of Bangladesh from 2006 to 2008. During the study period, neem oil solution was sprayed in the households of intervention area selected by cluster randomization, while no intervention was carried out for the control area. Socioeconomic and environmental information was also collected.

A secondary analysis of a household entomological survey of dengue was done to identify the most productive containers for *Aedes* larvae. The survey was conducted in Dhaka from August through October 2000, the peak epidemic period of dengue in Bangladesh. Field

research assistants looked for the containers with standing water, and for *Aedes* larvae within the containers.

(結果)

After 1 year of active disease surveillance in 2007, the number of reported VL cases was substantially increased over that of the previous year (RR = 1.38; 95% CI = 1.07 - 1.79). However, the incidence of VL in 2008 was significantly lower than in 2006 (RR = 0.19; 95% CI = 0.12 - 0.32). Neem oil was not found to be effective in the control of VL. However, the proportion of increased case reporting in 2007 was 5 times higher in control area than in intervention area. The proportion of decreased case reporting in 2008 was 2 times higher in intervention area than in control area. Factors associated with VL included younger age group (3-14 years), not having electricity in the household, never using mosquito-control measures, and never using a bed net.

A total of 9222 households and 38 777 containers were inspected for *Aedes* larvae. Overall tires, and the water reserving containers, e.g., tanks, drums, and earthen jars, were found to be the most important containers for *Aedes* larval breeding. Less importance was indicated for buckets, and discarded appliances. *Ae. aegypti* showed higher affinity for indoor containers, while *Ae. albopictus* were dominant outdoor breeder. Independent type of household, having any kind of water storage system (i.e., tanks, drums, earthen jars, and buckets) in the household, and having fully/partly shaded outdoor premise were significantly associated with household infestation of *Aedes* larvae.

(考察)

The increased incidence rate of clinical leishmaniasis in 2007 may indicate that community-based active surveillance using a simple diagnostic tool would be able to substantially increase the case reporting. Early case reporting and referral for treatment could significantly reduce the source of infection within the community, which resulted in a notably decreased incidence rate of VL in 2008. Although neem oil was not directly found to be effective in the control of VL, we may assume that neem intervention, along with active disease surveillance, played an important role to decrease the incidence rate of VL. This study also found that use of some kind of mosquito-control measures and bed nets were protective against VL. However, very few households reported using such measures regularly.

Water storage containers which usually contain large volume of water and are never emptied were consistently more likely to have *Aedes* larvae, such as earthen jars, tanks, and drums. On the other hand, containers which are relatively smaller in size and are frequently used have less chance to be infested with *Aedes* larvae. Another important breeding site is the tires. Usually tires are left abandoned. The collected rain water in tires is an ideal source of *Aedes* larvae.

(結論)

Although the unique disease limiting factors of VL make it a potential candidate for

elimination, massive efforts in community-based active disease surveillance coupled with scaled-up personal protection measures and integrated vector management interventions are required to achieve the goal. Neem oil would be a favorable option as an environment-friendly measure to control VL among the marginalized poor of the endemic areas. However, further research evidence is required with the support of local government and international organization.

Until a vaccine, clinical cure, or genetic strategy is available, control of dengue will continue to depend on suppression of the vector populations. Generalized community clean-up campaigns of vector breeding sites have had only a transient and limited effect on disease incidence. The identification and subsequent elimination of the most *Aedes* mosquito producing containers in a given area may potentially reduce mosquito density below a critical threshold, which could result in more efficient and cost-effective control campaigns.

審査の結果の要旨

(批評)

本研究はバングラデシュにおける内臓レーシュマニア症とデング熱の対策に資することを目的に、感染地域の住民を対象にして、内臓レーシュマニアに対しては積極的サーベイランス(Active surveillance)とニーム(neem)オイルスプレーの効果を罹患率で評価した。またデング熱に関しては、媒介する蚊の幼虫が発生する水がたまる容器を調査し、幼虫の有無とその量を測定した。その結果、対照地域との比較ではニームオイルスプレーの効果は明確に証明されなかったが、積極的サーベイランスにより罹患率が減少し、その効果が観察された。また、家に電気があること、蚊の予防策をとっていること、蚊帳を使用していることが、感染と負の関連が示された。デング熱に関しては、水が貯まる容器として最も多かったのがバケツであったが、幼虫の発見される率が最も高かったのは廃棄タイヤであった等々の結果が得られた。

「顧みられない熱帯病：NTD(Neglected Tropical Diseases)」は、途上国において保健衛生上の大きな課題となっている。その代表として内臓レーシュマニア症とデング熱があり、後者は最近日本でも話題となった。本研究はこれらの2つの疾患に対して、有効な対策を立案するために、実際の感染地域で実施された極めて実践的な疫学研究調査である。その結果は感染症疫学にもまた政策上極めて有用な情報を含んでおり、学術的にも保健行政上にも意義ある研究として高く評価できる

平成 27 年 1 月 6 日、学位論文審査委員会において、審査委員全員出席のもと論文について説明を求め、関連事項について質疑応答を行い、最終試験を行った。その結果、審査委員全員が合格と判定した。

よって、著者は博士（医学）の学位を受けるのに十分な資格を有するものと認める。